to be dryness. The number N, for the unattainable conditions assumed, comes out negative.

Another disease which the village watchman may be trusted to recognise in most instances is cholera. Cases of severe diarrhœa are doubtless frequently returned as cholera, but this does not sensibly impair the value of the registers, since the two diseases are usually prevalent about the same time. The mortality from cholera is subject to an annual variation quite as distinct as that of small-pox, but there are two maxima, in April and August, with a slight diminution between these months. The averages for the five years are :—

Jan.	Feb.	March	April	May	June
317	338	1304	9027	6541	6344
July	Aug.	Sept.	Oct.	Nov.	Dec.
5735	8129	4839	4665	1514	426

From the records of the army, police, and jail departments, extending over a longer series of years, it appears that the maximum mortality from cholera usually occurs in the rainy season. The secondary maximum in April becomes the principal one in this table on account of the excessive prevalence of cholera in April 1880. This epidemic was popularly attributed to the immense number of Hindu pilgrims assembled at the great religious fair of Hardwár, the disease having been caught from some infected persons in the crowd and spread abroad over the country as the pilgrims returned to their homes. The Sanitary Commissioner with the Government of India, however, does not accept this view, but seems to attribute the disease or its dissemination to some occult atmospheric influence. Whatever may ultimately prove to be the nature of the disease, there can be little doubt that in the North-West Provinces it is to a great extent dependent upon heat and moisture, being almost unknown in the cooler months of the dry season. To estimate the relative effects of these two atmospheric conditions, we may employ the formula—

$$n = N + \alpha t + \beta h;$$

the letters having similar significations to those mentioned with the previous formula. Combining the months in groups of four, commencing with December, we get three equations which give the following approximate results :— $\alpha = 281$; $\beta = 45$; $N = -20{,}076$. The principal effect is that due to high temperature ; while at the temperature assumed for N—zero F.—that number comes out negative. That is to say, in a perfectly dry atmosphere cholera would disappear at a temperature considerably above freezing, about 70° F., in fact, if we may judge from these tables. In the cold weather months, indeed, cholera never assumes epidemic proportions in the North-West Provinces ; but when the poison, whatever it may be, is widely disseminated, as in the beginning of 1882, after the great *mela* or religious fair at Allahabad, it remains nearly quiescent, manifesting itself only in a few sporadic cases until the commencement of the hot weather in April, when it breaks forth with alarming rapidity.

Deaths by violence are also, as a rule, unmistakable. In the Sanitary Commissioner's tables two causes of death are given which both come under this head—suicide and wounds—the latter presumably including only the results of murder and manslaughter, as there are separate headings for accidents and wild beasts. The average numbers of these deaths recorded each year are—

	Jan.	Feb.	March	April	May	June
Suicide ...	105	109	196	268	246	248
Wounds ...	105	94	105	119	125	128
Total ...	210	203	301	387	371	376
	July	Aug.	Sept.	Oct.	Nov.	Dec.
Suicides ...	246	242	269	250	151	100
Wounds ...	132	154	145	135	115	98
Total ...	378	396	414	385	266	198

Both series exhibit a distinct annual variation, notwithstanding some irregularities which would probably disappear if we had larger numbers to deal with, and in both the phases are similar, the minimum being reached in the middle of the cold weather, and the maximum in the hot season and rains. Both forms of death by violence are, in fact, manifestations of the same cause, irritability of temper ; for suicides in India are, as a rule, not the result of a fixed melancholia, three-fourths of the cases being those of young married women, who, finding life unbearable under the daily and hourly sting of the mother-in-law's tongue, end it at last by jumping down a well.

The monthly totals given in the last table may be approximately represented by the formula—

$$n = \alpha (t - x) + \beta h,$$

since they seem to depend both on temperature and humidity. In this formula x would be the temperature at which crimes of violence would disappear. Grouping the months in fours, commencing with November, we get three equations which give $\alpha = 7{\cdot}2$, $\beta = 2{\cdot}0$, and $x = 48{\cdot}4°$ F. Crimes of violence in India may therefore be said to be proportional in frequency to the tendency to *prickly heat*, that excruciating condition of the skin induced by a high temperature combined with moisture. Any one who has suffered from this ailment, and knows how it affected his temper, will readily understand how the conditions which produce it may sometimes lead to homicide and other crimes. And any one who has been in India in the cold weather and seen to what an abject condition the ordinary native is reduced by a temperature of 60° or so can believe that there is probably some truth in the arithmetical result above given, that about 48° crimes of violence would disappear, for at such a temperature nobody would possess a sufficient store of energy to enable him to commit crime of any graver description than petty larceny.

S. A. HILL

ALGÆ [1]

THE new work of Dr. Agardh, forms the third part of a series of monographs of algæ, two parts of which have already appeared. The first part contains the genera Caulerpa, Zomaria, and certain groups of Sargassum ; the second contains the Chondariaceæ and Dictyoteæ. The Ulvaceæ form the subject of the present monograph. This work should have special interest for algologists, from the circumstance that in it the author has expressed his views, and the reasons on which they are founded, concerning the much-debated question whether Bangia, Porphyra, Goniotrichum, and Erythrotrichia belong to the Florideæ or to the Ulvaceæ. The fact that Dr. Agardh still retains them among the Ulvaceæ is a sufficient proof that he is not convinced by the perusal of Dr. Berthold's work (noticed in NATURE, vol. xxvii. p. 385), and the statement of the latter that they belong to the Florideæ.

Dr. Agardh discusses the subject at some length, calmly and dispassionately ; and, considering his immense experience in the study of algæ, his opinion is deserving of much consideration. It may be as well to give the reader some idea of the arguments upon which the author has grounded his opinion. He relies principally, it will be seen, upon the assumed difference of the reproductive organs in the Ulvaceæ and in the Florideæ, namely, on the sporidia endowed with motion (zoospores) in the true Ulvaceæ ; and on the antheridia, cystocarps, and tetraspores of the Florideæ ; the antheridia and cystocarps being considered by Thuret and others as sexual, the tetraspores as asexual.

[1] "Til Algernes Systematik." Nya bidrag af J. G. Agardh (Tredje afdelningen). Lunds Arsskrift, tom. xix.

Dr. L. Rabenhorst's "Kryptogamen-Flora von Deutschland, Oesterreich, und der Schweiz." Zweiter Band : "Die Meeresalgen Deutschlands und Oesterreichs." Bearbeitet von F. Hauck. 4—6 Lieferung. (Leipzig : Eduard Kummer, 1883.)

Dr. Agardh points out that the organs with powers of motion, observed by Derbès and Solier, are scarcely to be referred to the Florideæ, because in their eruption from the plant, as well as in their movements, they have an appreciable analogy with the organs of Prasiola, described by the author in a new species, *P. cornucopiæ* (see Table III., fig. 74, *e*, *f*, *g*).

On the other hand, Dr. Agardh shows that the chief consideration which induced some algologists to remove Bangia and Porphyra from the Ulvaceæ to the Florideæ was derived from the quaternate division of the cells, which was thought to be analogous to the quaternate division of the tetraspores in the Florideæ. He points out that Janczewski and Thuret had observed that it was not tetraspores, but octospores, which resulted from the division in Porphyra; and he calls attention to the fact that the so-called octospores are themselves repeatedly divided into new generations of tetraspores and octospores, in the same manner as the cells or cell-contents in Prasiola, Tetraspora, Palmella, Monostroma, Ulva aureola (*Ilea fulvescens*), and some species of Enteromorpha divide; thus showing an analogy with these plants rather than with the Florideæ.

The author observes that if the organs of Porphyra be considered analogous with the tetraspores of the Florideæ, these organs, according to some authors, should possess different functions, the tetraspores being deemed neutral in the Florideæ, but the octospores sexual in Porphyra. If, he says, those organs which in Porphyra are called antheridia agree with the antheridia of the Florideæ; if, also, those 4-partite organs which constitute spores are to be compared with the tetraspores of the Florideæ; there still remain in Porphyra and Bangia no organs which can be considered identical with the capsular fruit of the Florideæ. If, therefore, those organs which form the principal characteristic of the Florideæ are absent, it is evident that Bangia and Porphyra are far inferior to the Florideæ, and that very distant affinities must be sought for them. Moreover, if those organs which are neutral in the Florideæ become sexual and female in Porphyra, this rather seems to indicate divergence than affinity.

With regard to Bangia, Dr. Agardh observes that the filaments of this plant growing together in patches, as already observed by Dillwyn and others, always vary in thickness and in appearance, and that this difference of appearance may have suggested the idea that they were of various kinds (male and female filaments). According to Dr. Agardh, these differences are merely differences of age; and the so-called special organs are to be considered rather as different states during the evolution of the fructification, than as distinct organs.

Reviewing the statements of different algologists with regard to the fructification of these plants, the author shows from their published works that much difference of opinion existed among them. Thus, according to Derbes and Solier, those organs in Bangia which they considered as male are said by them to be endowed with lively motion; while Thuret and Reinke, referring to the same organs, say that they are motionless. Again, the author observes that Janczewski, alluding to the octospores of Porphyra, says that they have an amœboid motion; Thuret, on the contrary, states that they are motionless.

After quoting Thuret's description ("Etud. Phyc.") of the processes of fructification in Porphyra, Dr. Agardh cites the following passage referring to the antheridia: "La division s'arrête plus tôt pour les spores et se prolonge davantage pour les antheridies; mais il n'y a pas de différence fondamentale dans le procédé. On en a la preuve dans les cas anormaux, déjà mentionnés par M. Janczewski, ou le contenu d'une même cellule primitive se change, partie en spores, partie en corpuscules mâles." So remarkable does this statement appear to Dr. Agardh that he quotes it also in the note to p. 26, where he thus comments on it: "Quomodo ii, qui hoc observarunt, sibimetipsis persuaserint eam partem contentus, quæ organis perhibitis fœmineis constaret, sub stadio evolutionis paulo posteriore in organa mascula non transmutaretur, mihi non liquet."

Leaving this subject to the consideration of algologists, the more general features of the work may now be noticed.

Dr. Agardh arranges the Ulvaceæ under the following genera: 1, Goniotrichum; 2, Erythrotrichia; 3, Bangia; 4, Porphyra; 5, Prasiola; 6? Mastodia; 7, Monostroma; 8, Ilea; 9, Enteromorpha; 10, Ulva; and 11, Letterstedtia.

Of these genera Mastodia and Letterstedtia are natives of the Southern Ocean. Ilea, of which one species only is known, *I. fulvescens* (*Ulva aureola*, C. Ag.), is a small tubular plant which grows at the mouths of some Swedish rivers. The cells of which it is composed are arranged in series of fours, as in Prasiola, but the colour is dusky as in Dictyota.

The other genera, of which many species are natives of these shores, will have more interest for British algologists. *Prasiola marina*, Crouan, which Dr. Agardh unites with *P. stipitata*, has been recently found in Scotland and in Devonshire; and the *Ulva calophylla* of Greville, and *Ulva crispa*, have been removed to Prasiola.

Of the twenty species of Monostroma, five, namely, *M. bullosum*, *M. laceratum*, *M. quaternarium*, *M. latissimum*, and *M. wittrockii* have been found on our coasts. To these Dr. Agardh adds another species, *M. lactuca* (*U. lactuca*, C. Ag.), which he considers identical with *M. undulatum* of Thuret, and probably with *M. pulchrum*, Farlow, of the east coast of North America. While thus transferring the specific name *lactuca* to a Monostroma, the author excludes it from Ulva, where it has been a sourse of confusion.

With regard to Porphyra, Dr. Agardh agrees with Dr. Greville in considering *P. linearis* as a distinct species; and he mentions *P. amethystea* as a native of England. Harvey had stated that the latter had been found on the west coast of Ireland, but the plant appears to have been unknown to him, and has not been found until recently, when Mr. G. W. Traill met with it on the east coast of Scotland. The arrangement of the cells in the plant is very beautiful.

In accordance with the views of most algologists, *P. vulgaris* and *P. laciniata* are united by the author; but he has changed the name of the plant to *P. umbilicalis* ("L. Sp.," ed. 2, 1633), of which he describes several forms. In his views of the structure of this alga, Dr. Agardh is at issue with Janczewski and Thuret. The last-mentioned authors state that the vegetative structure of the plant is always monostromatic, and that it is in the fruitful parts only that the cells are arranged in two series. Dr. Agardh, on the contrary, says that the alga is at all times distromatic. A reference to Plate II., fig. 61, *t*, will show that the two strata seen in the transverse section do not exhibit that subdivision of the cells which constitutes the fruit.

Dr. Agardh agrees with M. le Jolis in removing the *Ulva linza* of Harvey to Enteromorpha, where it takes the name of *E. linza*. Of Ulva, seven species only are enumerated. Under *U. rigida* there are no fewer than twenty-four synonyms. While, however, the author deserves thanks for clearing away so many reputed species, he describes many forms of this very generally distributed alga.

Enough has now been said to show the interest this work should have for algologists. It is illustrated by four plates, beautifully executed, containing 124 figures. Although the title is Swedish, the work is written in Latin.

Of Rabenhorst's "Kryptogamen-Flora," Nos. 4, 5, and 6 of Part II., in which the marine algæ are described by M. Hauck, have recently appeared. Numbers 4

and 5 treat of the Florideæ, which are concluded in the sixth part. Then follow the Phæophyceæ; but before touching on these, a few points relative to some of the Florideæ call for observation.

M. Hauck tells us that in Gelidium the cystocarps are of two kinds—(1) those in which the placenta is basal, and have consequently only one series of gemmidia; (2) those in which the placenta is central, on both sides of which the gemmidia are placed. M. Hauck does not seem to be aware that the former were long ago separated by Dr. Agardh from Gelidium, under the name of Pterocladia, the typical species of which is *Pt. lucida*, a very common alga in the Southern Ocean. The *Gelidium capillaceum*, described at p. 190, is a true Pterocladia, and has been described as such by M. Bornet under the name of *Pt. capillacea*. M. Hauck mentions this name among the synonyms of *G. capillaceum*, and at p. 191, fig. 82, he gives us copies of M. Bornet's figures of the cystocarps of this plant, and also of Gelidium; thus showing the characteristic differences between the two algæ; it is therefore surprising to find that M. Hauck still retains the old name of the plant, and places it under the genus Gelidium.

The cystocarpic fruit of *Dasya punicea*, apparently unknown in the Adriatic, was found on our southern coast as long ago as 1859. Before that time a specimen bearing cystocarps was collected by Miss Catlow in Jersey, and Dr. Harvey gave to it the provisional name of *Dasya catlowviæ*. There is considerable difference in the aspect of the plants which bear cystocarps and those which bear stichidia; so much so, that they have been taken for distinct species. British specimens of this plant are much larger than those of the Adriatic.

M. Hauck describes the tetraspores of *Melobesia corallina* as "zweitheilig," and he refers to Solms' "Corallinenalgen des Golfes von Neapel," Table III., fig. 23. Now, on turning to this figure in the work of Graf Solms, it will be seen that the tetraspores are 4-partite. It is true that they have been described by MM. Crouan and Areschoug as dipartite, but, according to the observations of M. Rosenoff in his very interesting "Récherches sur les Melobésiées," p. 45, there seems good reason to believe that, although tetraspores are often found divided into two parts only, the complete number is four.

With regard to *M. macrocarpa*, M. Hauck is apparently right in uniting it with *M. pustulata*, and also in considering *M. corticiformis* as a synonym of *M. membranacea*.

In a former number of his work, M. Hauck had stated that the tetraspores of Nemaleon were unknown. They had, however, been described by Dr. Agardh in "Sp. Gen. et Ord. Algarum," vol. ii. p. 417, and again in the "Epicrisis," p. 507; but the author did not, in either work, state in which species he had found them. Some uncertainty, therefore, existed on this point; and Thuret was of opinion that up to his time there had been no trustworthy record of the discovery of the tetraspores of Nemaleon. It would have been easy to solve the doubt by an appeal to Dr. Agardh, who is always ready and willing to impart information, but no one seems to have thought of adopting this course. The writer is glad to be able to mention, on the authority of Dr. Agardh, that he (Dr. Agardh) found tetraspores on a plant of *Nemaleon multifidum* from Copenhagen, but he had met with them only once. It is hoped that this statement will finally settle the question.

The description of the second division of the marine algæ, Phæophyceæ, is begun at p. 282 with the Fucoideæ; these are followed by the Dictyoteæ, and after these follow the Phæozoosporeæ. Each order is preceded by a careful description of the structure and fructification of the plants included in it, and an enumeration of the genera; in the case of the Phæozoosporeæ, a short diagnosis of each family is inserted. We are glad to see, from the long list of synonyms appended to the description of many plants, that M. Hauck has greatly diminished the number of species, especially of those from the Adriatic.

British algologists will find in the later numbers of this work, as well as in those which preceded them, much that is interesting and instructive. The succeeding numbers will be welcome. It is hoped that they will be followed by a good index, which will add very much to the value of the work.

MARY P. MERRIFIELD

METEOROLOGICAL OBSERVATIONS FROM BEN NEVIS

A WEATHER REPORT from the Ben Nevis Observatory is now published daily, which gives the observations made at 9 a.m. and 9 p.m., these being the hours adopted by the Meteorological Societies of the British Islands, to which are added the highest and lowest temperatures, the amount of rain and snow in all cases where it is possible to measure it, the height of the snow on the plateau, measured by the snow gauge, the hours of sunshine, taken directly from the sunshine recorder, and the quantity of ozone, droughts, changes of wind, auroras, glories, halos, electrical and other phenomena, recorded as they occur. The record is strictly one of observations, and as these are made at the usual observing-hours, British meteorologists and all persons interested in the weather are thus afforded the means of comparing their own observations with those made at Ben Nevis Observatory, which is by far the most valuable high-level station we possess, as furnishing data of the first importance in the study of the weather changes of Europe. In the winter climate of the Ben, the problem of hygrometric observation is beset with formidable difficulties. With a view to the practical solution of these it is part of the winter's programme that Mr. Omond conduct a series of investigations with a hygrometer of a novel description specially designed by Prof. Chrystal for the purpose. In the meantime, and until the problem be solved, the word "Sat," meaning saturation, is entered in the wet bulb column in all cases when the wet does not read lower than the dry bulb, it being evident that in such cases the air is all but, if not altogether, saturated. Indeed, a saturated atmosphere at all temperatures may be almost regarded as a persistent feature in the climatology of the Ben. Occasionally, however, as recently happened about Christmas and the New Year, a sudden change sets in, the clouds clear away, the sun blazes out in a sky of marvellous clearness, and a dryness of air comes on such as is rarely if ever experienced at lower levels. In these circumstances the dry and wet bulb readings separate to a degree so extraordinary that Glaisher's tables are no longer of any use in calculating the humidities of the air. As the periods of sudden and intense dryness of the atmosphere are intimately connected with the anti-cyclonic systems prevailing at the time in north-western Europe, it is not improbable that a careful record and study of them will lead to a more exact forecasting of some of our most important weather changes.

By and by the observations, combined with those made by Mr. Livingstone at the low-level station at Fort William, will furnish the data for ascertaining what is the normal distribution of pressure, temperature, and humidity in the stratum of the atmosphere between the top of Ben Nevis and the level of the sea at its base. These being once determined, all deviations therefrom, whenever occurring, will be readily seen. When the departures from the normals to subsequent changes of weather have been further investigated and their relations more accurately determined, the high expectations formed regarding the part to be played by the high-level station on Ben Nevis in contributing important data towards the forecasting of the weather of the British Islands will doubtless be realised. It must not, however, be forgotten that